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Discovery of a new species of *Zophoessa* Doubleday, 1849 from NW Yunnan, China (Lepidoptera: Nymphalidae)

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Abstract: *Zophoessa yemadingdui* **sp. nov.** is described from northwestern Yunnan Province, China. The new species can be distinguished from the reminiscent *Z. procne* Leech, 1891 by the absence of pale postdiscal spots on both sides of the forewing, the down-curved (lateral view) and tapered (dorsal view) uncus in the male genitalia, the more sharply pointed apex of valva, the markedly longer aedeagus, and the consistently narrower androconia bearing only three to four apical spines. Differences between the new species and other congeners previously placed in the *Z. procne* species group as well as the taxonomic position of the new species are also discussed.

Keywords: China, *Lethe*, new species, Nymphalidae, *Zophoessa*

中国云南省西北部发现的幽眼蝶属一新种记述（鳞翅目：蛱蝶科）

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摘要：本文记述了发现于中国云南省西北部的眼蝶一新种：业马定都幽眼蝶（*Zophoessa yemadingdui* **sp. nov.**）。该新种与其近缘种彩斑幽眼蝶（*Z. procne* Leech, 1891）的区别在于：前翅外中域缺乏浅色斑块；雄性外生殖器的钩形突侧面观下弯、背面观渐细；抱握瓣末端更尖锐；阳茎显著更长；以及香鳞更细且仅具三至四个端刺。文中还讨论了该新种与先前被归入彩斑幽眼蝶种组的其他近似种之间的差异，并探讨了新种的分类地位。

关键词：中国，黛眼蝶属，新种，蛱蝶科，幽眼蝶属

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Introduction

The classification of the genus *Lethe* Hübner, [1819] (sensu lato) has long been debated. Moore (1892) initiated this by splitting the group into multiple small genera, while Leech (1892) contemporaneously recognized just two: *Lethe* Hübner and *Zophoessa* Doubleday, 1849. Evans (1924) later merged Leech's two genera by subsuming them, along with *Neope* Moore, 1866, into a single genus—a scheme followed by Talbot (1949). Although de Lesse (1957) returned to a two-genus framework similar to that of Leech (1892), the species assigned to *Lethe* and *Zophoessa* in these two systems differed significantly. The now-standard classification, retaining only *Lethe* alongside *Neope*, was first proposed by D' Abrera (1985) and has been followed by authors such as Bozano (1999) and Lang (2017, 2020).

However, a recent molecular analysis based on three nuDNA gene fragments (Huang 2025, in press) does not support D' Abrera's (1985) classification. It reveals that *Lethe* (sensu D' Abrera 1985) is polyphyletic, comprising four well-supported, distantly related clades. The study also places *Zophoessa* in a more basal position than *Lethe* (*sensu* Huang 2025), separated by substantial genetic divergence. Morphologically, *Zophoessa* differs from *Lethe* in several key characteristics: the hindwing underside has two bands in the discal cell (in wing-pattern); forewing vein 12 ends at the costa not beyond the root of vein 4 and the upper angle of the forewing discocellular cell is evenly rounded (in venation); and the terminal sclerites of the aedeagus flex into the vesica from the lateral sides, not dorsoventrally (in male genitalia).

During preparatory work for revising species groups of *Lethe* and *Zophoessa*, the first author obtained a remarkable male specimen via Xianyu (闲鱼) from Mr. Yemadingdu (业马定都). The specimen's distinctive appearance and peculiar wing-pattern features strongly indicated a new species highly divergent from all known relatives. However, the original seller provided no additional material. Subsequently, a collaboration was initiated when Mr. C-H Wang (the second author) contacted the first author, reporting that he and Mr. M-L Bi had procured five unusual specimens resembling *Z. procne* Leech, 1891 yet exhibiting pronounced and consistent morphological differences. Subsequent study confirmed this as a new species, characterized by stable diagnostic features, evidence of an established population, and significant divergences in androconia and male genitalia. Moreover, the first author recalled a previously overlooked specimen photographed by Dr. S-Y Huang in the collection of the Natural History Museum, London, which was labeled as a "potential hybrid". This specimen has now been identified as the same new species. It is possible that the Museum's restrictive policy on specimen dissection inadvertently preserved this taxonomic discovery for our description.

Taxonomy

Zophoessa yemadingdui sp. nov. 业马定都幽眼蝶

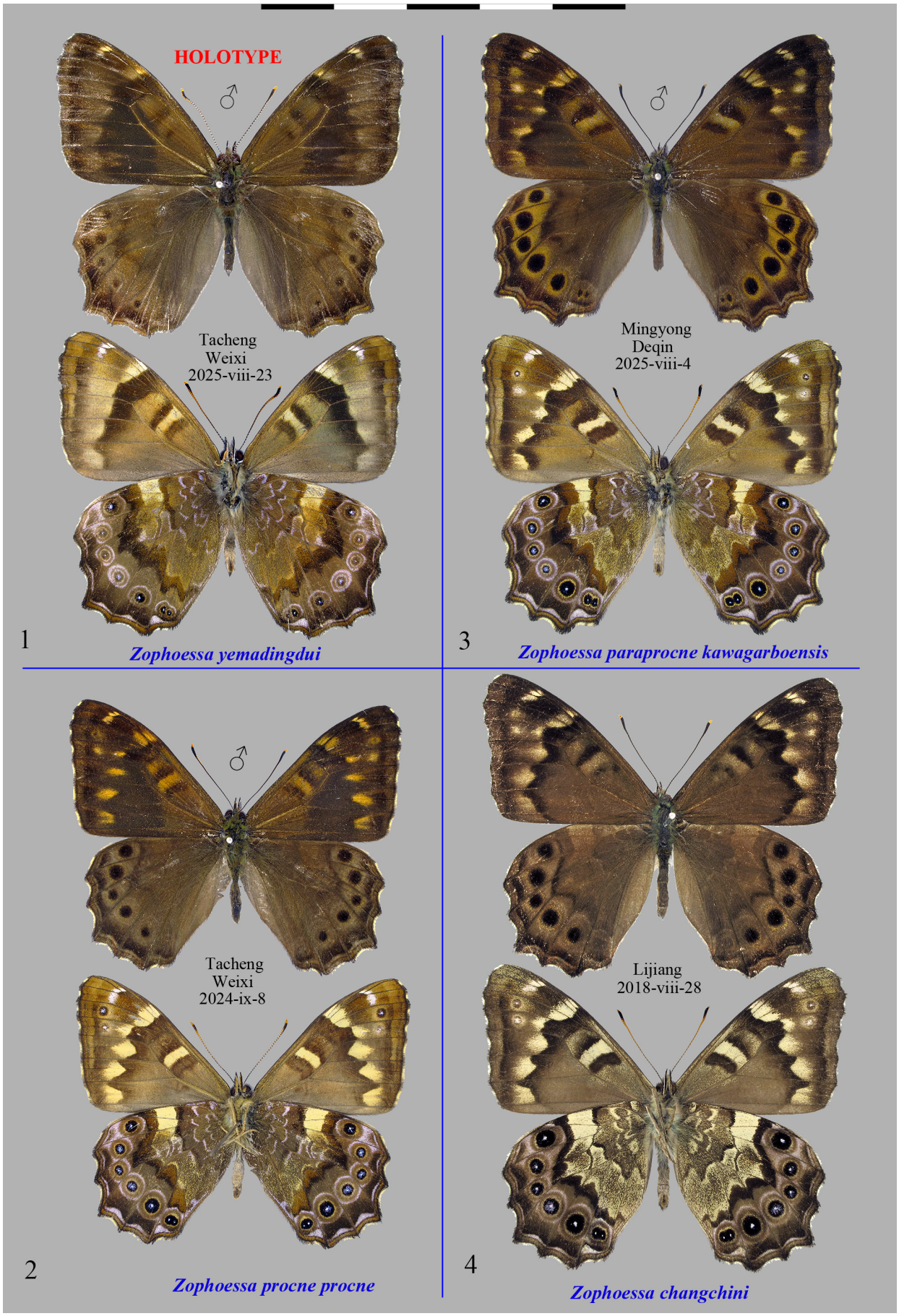
https://zoobank.org/DDE238C9-CBBC-4DFC-831F-938A2AA2889B

Figs 1, 5, 11, 12, 23

Holotype: ♂ (Length of forewing 29.5 mm): China, Yunnan, Diqing Tibetan Autonomous Prefecture, Weixi County, Chuanda village, 3200 m, 23.VIII.2025, Yemadingdu leg. Deposited in the Biological Laboratory of Shanghai Normal University, Shanghai, China.

Paratypes: 2 ♂♂ (collection of H Huang, Qingdao), same locality as holotype, 20-24.VIII.2025, Yemadingdu leg.; 1 ♂ (collection of CH Wang, Beijing), same locality as holotype, 20-24.VIII.2025, Yemadingdu leg.; 1 ♂ (collection of ZJ Wu, Fuzhou), same locality as holotype, 20-24.VIII.2025, Yemadingdu leg.; 1 ♂ (collection of ML Bi, Beijing), Yunnan: Diqing Prefecture: Deqin County, Tuoding, 3000 m, 20.VIII.2025, Yemadingdu leg.

Etymology. The species is named after Mr. Yemadingdu (业马定都), Weixi who discovered this amazing new species.



FIGURES 1–4. Habitus of *Zophoessa* species, upper side & underside. Scale bar = 1 cm.

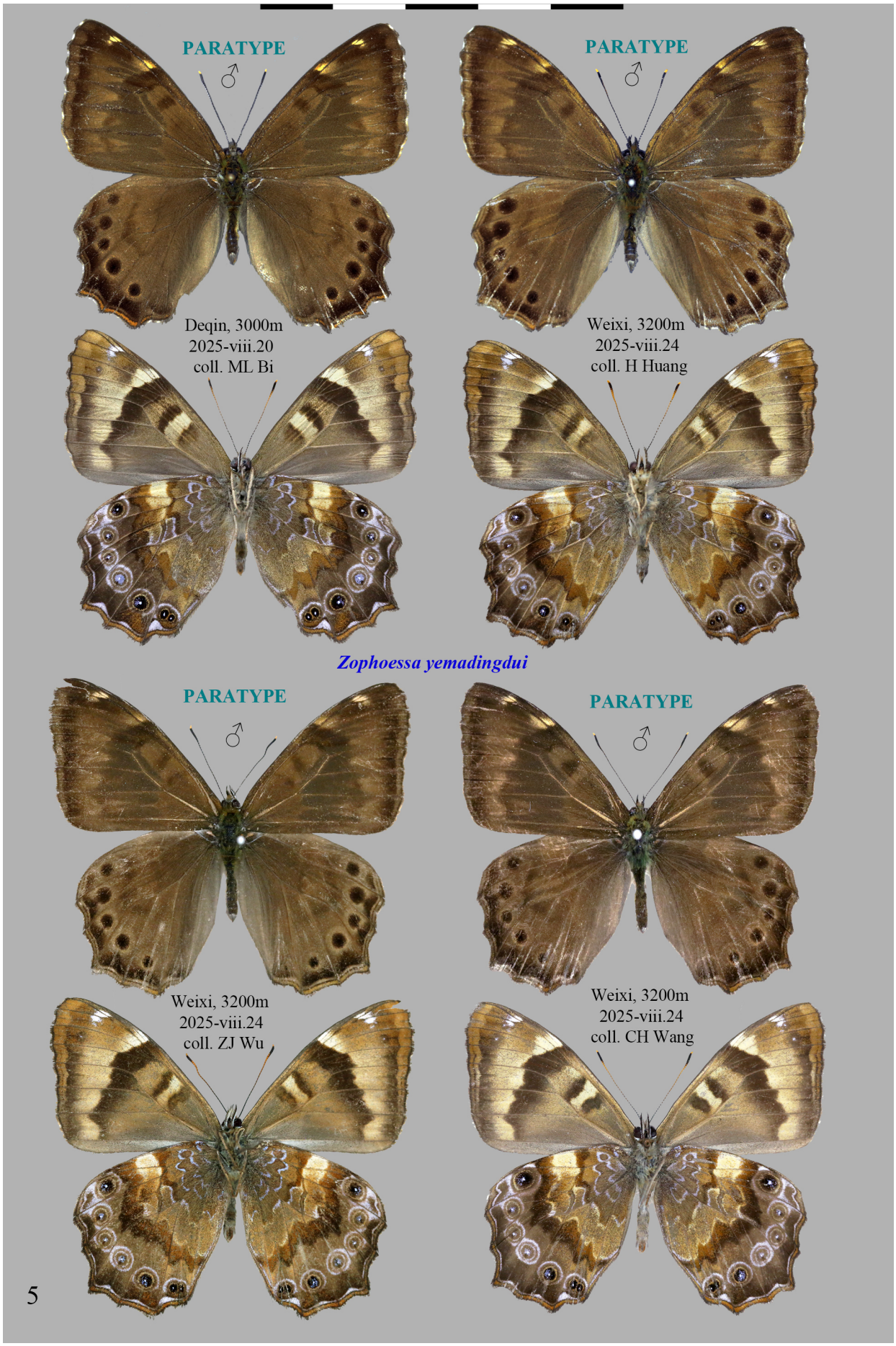
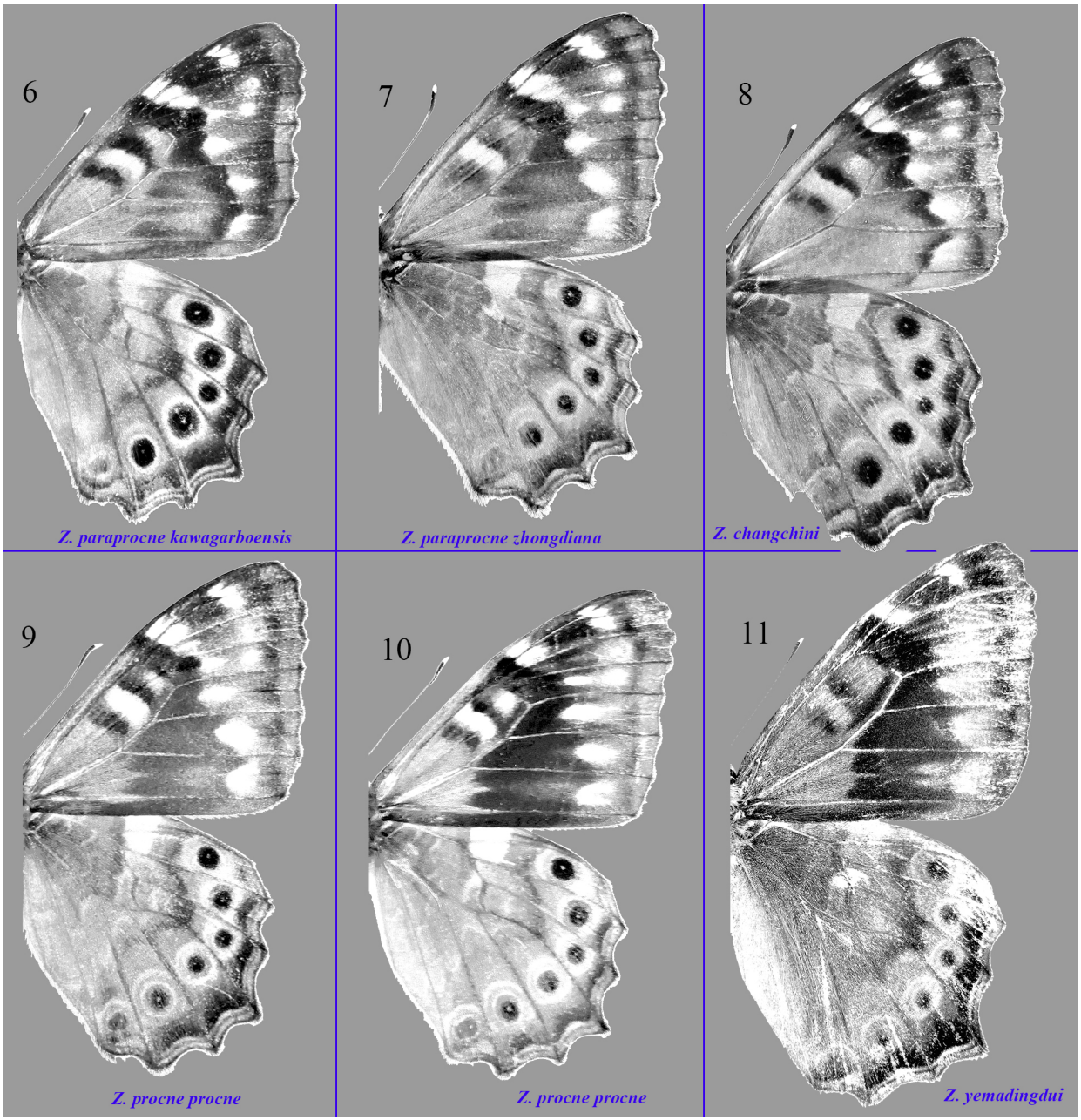
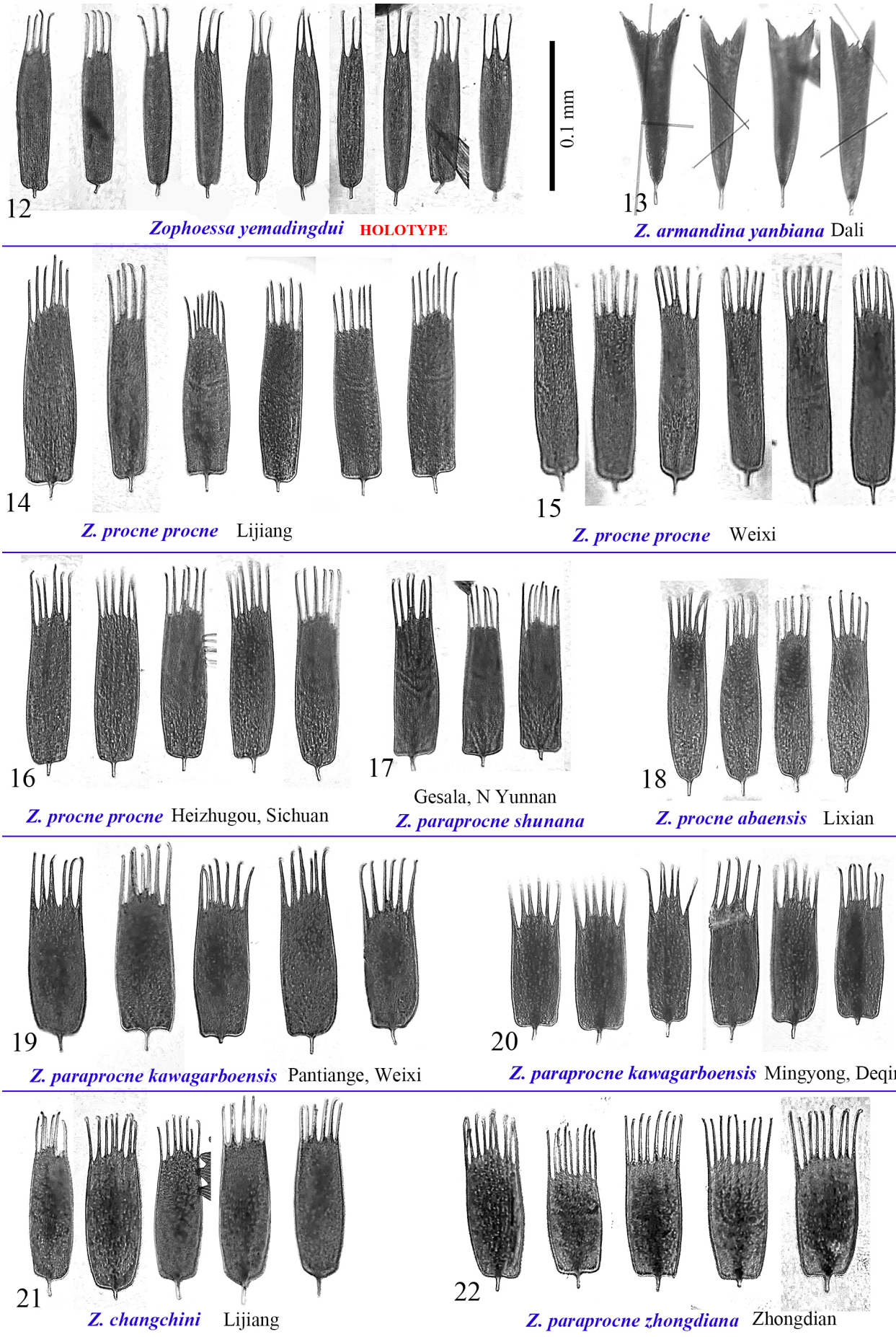


FIGURE 5. Habitus of *Zophoessa yemadingdui* **sp. nov.**, paratypes under same scale. Scale bar = 1 cm.

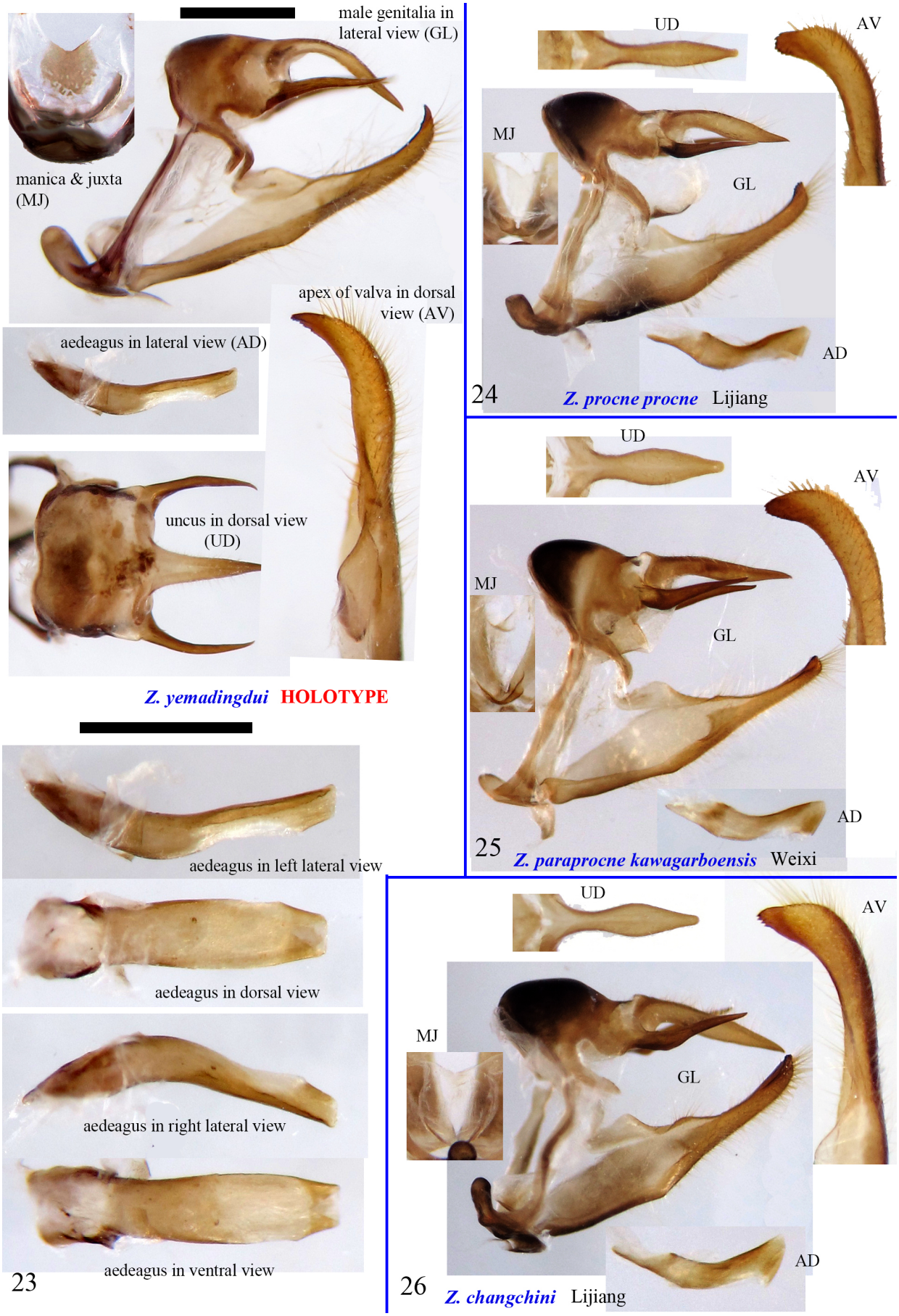


FIGURES 6–11. Photographs using strong transmitted light and overexposure to show the male brand of *Zophoessa* species.

Diagnosis. This new species is most similar to *Zophoessa procne* Leech, 1891, but can be distinguished from the latter by the following combination of characters: 1) Forewing upperside without a series of postdiscal yellow patches which are well defined in *Z. procne*; 2) Forewing underside with postdiscal line between veins 2–5 rather smooth, recalling that of *Z. armandina* (Oberthür, 1881), not zigzag and associated with clearly defined yellow spots as in *Z. procne*; 3) Forewing underside with subapical ocellus in space 5 reduced or obsolete, not clearly defined as in *Z. procne*; 4) Androconia consistently thinner, with only three to four apical spines; 5) Uncus of male genitalia strongly bent downward in lateral view, not so straight as in *Z. procne*; 6) Uncus without a basal tubercle on the dorsal margin in lateral view; 7) Uncus gradually tapered apically in dorsal view, not swollen at middle as in *Z. procne*; 8) Aedeagus markedly longer; 9) Manica more strongly sclerotized and pigmented; 10) Valva longer, with apex in full face view more sharply pointed than in *Z. procne*.



FIGURES 12–22. Androconia of *Zophoessa* species. Scale bar = 0.1 mm.



FIGURES 23–26. Male genitalia of *Zophoessa* species. Scale bars = 1 mm. The longer scale bar applies to the enlarged views of the aedeagus and valval apex.

Discussion. *Zophoessa procne* is the closest relative to the new species in wing pattern, as both possess a large, serrated male brand on the forewing upperside and very similar hindwing underside patterns. No other species share this specific combination of characters. Nevertheless, the two species are sympatric in nature. Given the striking morphological differences in wing pattern, androconia, and male genitalia, coupled with the discovery of multiple specimens, the new species is undoubtedly distinct from *Z. procne*. Examination of other species related to *Z. procne* confirms that the new species is separable from all of them.

It is necessary to address the taxonomy of *Z. procne* and its closest relatives. The currently recognized subspecies under *Z. procne* and its closest congener, *Z. paraprocne* (Lang & Liu 2014), are in a convoluted status. While these taxonomic units themselves have been thoroughly described, with photographs of male genitalia and androconia taken from type specimens published—readily confirming that none are conspecific with *Z. yemadingdui* **sp. nov.** —the issue lies in the species boundary between *Z. procne* and *Z. paraprocne*, as well as the true specific placement of their respective subspecies. Current classification is based on the morphology of the male brands and androconia. However, the first author's unpublished research indicates that these traits often exhibit confusing combinations across different geographical populations. This situation urgently requires taxonomic clarification. The first author is currently conducting relevant molecular research, which is expected to resolve this classification issue in the near future.

An anonymous researcher once misidentified a specimen of this new species (in the Natural History Museum, London) as a hybrid between *Z. procne* and *Z. armandina* (Oberthür), based on the forewing underside pattern similarity—a plausible initial hypothesis. However, without examining the androconia and male genitalia, he missed the chance to describe it. The androconia of the new species (Fig. 12), while fitting the general type for the *Z. procne* group (Figs 14–22), is entirely different from that of *Z. armandina* (Fig. 13). Furthermore, the male genitalia (Fig. 23) have a much thinner (lateral view) and tapered (dorsal view) uncus and a longer aedeagus than in both *Z. procne* and *Z. armandina*, showing no intermediate form. Consequently, the number of type specimens and these consistent morphological data confirm it is not an aberrant form but a valid new species. A note on *Z. armandina*: historical taxonomic opinions (e.g., Lang 2017; S-Y Huang *et al.* 2024; Lang 2024) have been controversial, likely due to the subtle differentiation in male genitalia. However, a molecular study is underway and is expected to elucidate this issue, as the first author collected fresh specimens for all relevant taxa in 2025.

Lang (2017) divided *Zophoessa* (treated as a subgenus at the time) into a series of groups and subgroups. He defined the *Z. procne* subgroup (*Lethe procne* subgroup, *sensu* Lang 2017) by the following characters: androconia with more than four apical spines, an uncus that is swollen dorsally at the base and not bent downwards, and a broad, serrated apex of valva. The discovery of *Z. yemadingdui* **sp. nov.** contradicts this definition, as it possesses androconia with only three to four apical spines, an uncus that is bent downwards and not swollen at the base, and a thin, sharp apex of valva.

On the other hand, the new species partially agrees with the features of *Z. moelleri* group (*sensu* Lang, 2017) in having a similarly uncus in male genitalia. However, it also differs from the *Z. moelleri* group by having androconia with only three to four apical spines (vs. more than four), a rather flat tegumen in lateral view, and a slightly serrate (vs. smooth) apex of valva. Nevertheless, the new species shares a highly similar hindwing underside pattern exclusively presented in *Z. procne* group (Figs 2–4), namely the brighter yellow discal area between the postdiscal and antediscal bands above vein 6—a peculiar character previously known only from the *Z. procne* group.

A revised subdivision of *Zophoessa*, based on molecular approaches conducted by the first author, is currently underway and is expected to be published in the near future.

Range. NW Yunnan (Deqin and Weixi).

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Additional information

Author contributions: First author: Conducted all research work, including morphological comparisons, species description, and manuscript preparation. Second author: Collected the paratypes. Third author: Collected the paratypes.

Conflict of interest: The authors have declared that no competing interests exist.

Data availability: All of the data that support the findings of this study are available in the main text.

Ethical statement: No ethical statement was reported.

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